On-going Structural Collapse Rescue Training Requirements for the Edina Fire Department

Special Operations Team

Executive Leadership

By: Thomas M. Schmitz
Edina Fire Department
Edina, Minnesota

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Abstract

In 2004, Edina Fire Department became a member of Minnesota Task Force 1. The State established the program to respond to structural collapse rescues. The program only provided initial equipment and training. The problem is Edina does not have on-going training specific to structural collapse rescue.

Descriptive research was used to answer how other programs were conducting on-going structural collapse rescue training, what standards they follow; their challenges; and their financial costs for training.

Literature review and a survey were used to answer the research questions. Eighty-three percent of the survey respondents had on-going training.

Recommendation is Edina Fire Department should develops an on-going training program for structural collapse rescue.

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Introduction

Two of the greatest challenges facing the fire service today are the increasing responsibilities and the effort required to meet them. For example, the fallout of September 11, 2001, has increased the need for training and preparation to respond to acts of terrorism and large scale disasters both manmade and natural. Billions of federal dollars have been allocated for this effort; however, in many cases the challenge is not financial but more importantly time, or the lack of enough time, to complete all the necessary training. In addition to the events of September 11, there have been recent events such as the hurricanes that struck the gulf coast states that revealed shortcomings in response capabilities. The federal response assets were overwhelmed and most certainly the local and state agencies were also. A lack of training on the part of some responders was a key factor in the poor outcome. Campbell (2004, p.34) says efforts to be better prepared and avoid a repeat of recent history, numerous states around the country are developing specialized teams to respond to such events, augment federal response teams and provide assistance to neighboring states. The State of Minnesota is no exception to this effort with the development of Minnesota Task Force 1 (MN-TF 1), Urban Search and Rescue Team. The Department of Public Safety (DPS), Division of Homeland Security and Emergency Management (HSEM) provided funding to equip and train several fire departments, of which Edina Fire Department was a recipient, to respond to structural collapse rescues within the State.

The problem is Edina Fire Department's Special Operations Team (SOT) does not have a formal on-going structural collapse rescue training program. The current State program only provided for initial training but does not provide for nor have on-going training requirements for participating departments. This results in lost knowledge, skill, and abilities which will

compromise the safety and effectiveness of the team. The purpose of this research is to describe what other structural collapse rescue teams in the nation are doing for on-going training requirements. The findings will provide the Edina Fire Department with recommendations for the development of an on-going training program to ensure a well-trained and effective response team. This research project was accomplished utilizing the descriptive research methodology to answer the following research questions:

1. What standards apply to on-going or continuing training requirements for structural collapse rescue teams?
2. What are the Federal Emergency Management Agency Urban Search and Rescue Task Force Teams doing for on-going training needs?
3. What are other state-organized structural collapse rescue teams doing for on-going training needs?
4. What challenges are teams facing that prohibit their members from participating in on-going training opportunities?
5. What are the financial costs associated with on-going training for structural collapse rescue response?

Edina Fire Department has been engaged in technical rescue response for several years and it understands that time is a critical ingredient in rescue. The department understands that the best approach is having a well-developed plan that includes a training program focusing on the need to know material first followed by the nice to know material as time permits.

Background and Significance

In April of 1998, the Edina Fire Department established the SOT to respond to technical rescue incidents within the city and to provide mutual aid to jurisdictions within Hennepin

County. Since its inception the team has seen many successes from numerous rescues within the city and county, to several grant acquisitions, to most recently its selection by the State as a participant in the MN-TF 1 program.

The City of Edina was established over 135 years ago and is located in southwestern Hennepin County, Minnesota. Edina shares its northeast border with the city of Minneapolis. Residential areas comprise the largest portion of the 16-square miles and are home to over 48,000 residents. The upper class community is 98% developed with several high-rise residential structures, several office and warehouse businesses, moderate industrial and manufacturing businesses, and strong retail and medical services industries. The city sees a three-fold increase in the population on weekdays. As a full-service metropolitan community, Edina has the typical challenges associated with most first-ring suburbs—major restoration and renovation projects and many transportation mechanisms running within its borders. The Edina Fire Department covers the city daily from two fire stations with eight, full-time, 24-hour shift members consisting of one captain, one lieutenant and six firefighter/paramedics. The overall workforce consists of 30 full-time staff and 15 paid-on-call staff. The fire department provides four primary services which include full advanced life support ambulance service; fire inspections, code enforcement, and fire/injury prevention activities; specialized rescue such as rope, confined space, trench, water/ice, vehicle/machinery, and structural collapse rescue; and fire suppression.

The department manages the SOT program by dividing the staff into two primary categories: core members and support members. The core members consist of 20 full-time members who receive extensive training in technical rescue operations while the remainder of the personnel are trained in support role activities to augment the core team members' capabilities. The initial training program for core members prior to the department's involvement

with MN-TF 1 was approximately 150 hours in the following technical rescue disciplines: rescue principles – 8 hours; rope rescue – 40 hours; confined space rescue – 40 hours; trench collapse rescue – 40 hours' water/ice rescue – 16 hours; and structural collapse rescue – 16 hours. The support members received a total of 72 hours of initial training in the same disciplines. Since 1998, the on-going training for the core members has consisted of a minimum of eight hours a month covering topics in the various disciplines. The support members have received monthly three-hour training sessions. Core team members are expected to attend the monthly training on their days off and earn overtime pay for their attendance. The support level training is taught by core members on each respective shift during normally scheduled shift training. The training chief oversees all aspects of the paid-on-call training and provides support level training for these members.

In 2003 the Minnesota DPS, HSEM sought five sponsoring fire departments throughout the state to participate in Minnesota Task Force 1, Urban Search and Rescue Team. The agreement between the State and the participating members was that funding would include a one-time equipment and training purchase initiative, but no on-going training or equipment needs would be provided. The three-year operational timeline stipulated that all five agencies needed to train their members to the technician level (as defined in the National Fire Protection Association (NFPA) 1670 Standard on Operations and Training for Technical Search and Rescue Incidents) in rope rescue, confined space rescue, and trench rescue before completing the Federal Emergency Management Agency (FEMA) Structural Collapse Technician (SCT) equivalency course (Appendix A). Edina SOT core members already had met these requirements except for completion of the FEMA 80-hour SCT course.

Along with Edina, Dakota County Special Operations Team (made up of 35-members from 23 agencies within Dakota County), Rochester Fire Department, St. Paul Fire Department and Minneapolis Fire Department were selected as the five sponsoring agencies. The state selected Minneapolis Fire Department as the lead agency for the program and as such they invited several fire departments within the metropolitan area to participate in the program under their supervision.

During this implementation phase of the program there has been no effort on the part of the State to formalize an on-going training program. In fact, once the initial training and equipment purchasing was completed the State has not provided any clear guidance or expectations to the participating agencies. Each of five teams is defining their own level of on-going training. The first SCT class graduated in late 2004 and included members of several departments. By the end of 2006, over 180 personnel from approximately 35 participating agencies have received all their training; however, many of these members have not seen on-going training since they walked off the training grounds. In 2007 another 60 members will complete their training which will result in a force of almost 250 members. Each department is expected to develop and implement an internal program that will keep their members proficient in the necessary skills, however it is very difficult for departments to mandate additional training when their schedules are already busy with the day-to-day training. The inability to find the funds to cover the overtime costs will make it an even bigger challenge to justify their continued involvement.

The significance of this research paper will identify the necessary elements that must be included in Edina's SOT on-going training program without compromising the department's current responsibilities. It will be critical to our success and our collaboration with the other

participating agencies. The Executive Leadership course taught in July 2006 at National Fire Academy, Executive Fire Officer Program, (United States Fire Administration [USFA], 2005), emphasized that the success of fire service leaders will be assessed through their ability to create a plan that maps out the multitude of responsibilities and provides direction in managing these responsibilities.

Literature Review

A literature review was conducted to help provide answers to the research questions: (1) What standards apply to on-going or continuing training requirements for structural collapse rescue teams? (2) What are the Federal Emergency Management Agency Urban Search and Rescue Task Force Teams doing for on-going training needs? (3) What are other state-organized structural collapse rescue teams doing for on-going training needs? (4) What challenges are teams facing that prohibit their members from participating in on-going training opportunities? (5) What are the financial costs associated with on-going training for structural collapse rescue response? In general, traditional literature research attempts revealed little information regarding specific on-going training requirements for structural collapse rescue teams. There was plenty of information regarding the elements necessary for initial training but only general statements made to the effect that continuing training was needed to maintain proficiency of skills. It was anticipated that the survey instrument would provide better answers to the research questions.

(1) What standards apply to on-going or continuing training requirements for structural collapse rescue teams? The Occupational Safety and Health Administration (OSHA) and the National Fire Protection Association (NFPA) are two primary organizations that provide direction for the fire service in the United States. OSHA standards are mandated through federal or state law, however the standards are geared more towards the construction, agricultural,

maritime, and general industries. The fire service has to decipher these standards and apply them when indicated. There are only a few OSHA standards that closely resemble anything related to structural collapse. The Permit-required Confined Space (OSHA, 1910.146), Excavations; (OSHA, 1926.650), and the Hazardous Waste Operations and Emergency Response (OSHA, 1910.120) Standards are found in Title 29 of the Code of Federal Regulations. The standards for Permit-required Confined Space, and Hazardous Waste Operations and Emergency Response are found in 1910, Occupational Safety and Health (general industry) section and the Excavations Standard is found in 1926, Safety and Health Regulations for Construction. In each of the standards the training requirements mandate annual training but do not specify minimum hours or levels of training proficiencies. The Permit-required Confined Space Standard states entry training should be representative of the permit spaces found in the response area and that basic first aid should be included in the training. The Hazardous Waste Operations and Emergency Response Standard states that emergency responders "shall receive annual refresher training of sufficient content and duration to maintain competencies, or shall demonstrate competency in those areas at least yearly" (1910.120(q)(8)(i)). The Excavations Standard mandates training on hazards of trench activities, including proper use of shoring. Also, there is no mention of minimum hours or how often the training should occur. There is no OSHA standard that is specific to structural collapse rescue.

On the other hand, the NFPA is a great source of information to provide best practices in our industry. Almost every fire department in the county strives to meet the recommendations outlined in these standards. Even though the standards are industry consensus standards several of them have become the expected performance criteria or best practices around the world and deviation would not be in the best interest of the department. Clem (2001) says even though

federal law does not mandate compliance with NFPA standards, once an agency adopts them within the chain of command they become mandatory. A review of NFPA 1710, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Department, 2004 Edition (NFPA 1710, 2004) and 1720, Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Volunteer Fire Departments, 2004 Edition, (NFPA 1720, 2004) says urban search and rescue is a discipline that falls under special operations, and for departments engaged in such activities they shall have a training program that ensures personnel are trained and competent to safely execute all responsibilities. As stated in the Special Operations Training section of NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, “fire departments shall provide specific and advanced training to members who engage in special operations as a technician” (NFPA 1500, 2007, section, 5.4.1).The standard stresses that the goal of any on-going training should focus on preventing skill degradation and prevention of injuries and death to its members. Battalion Chief LaFemina (2004) stresses that serious injury or even death could results because of improperly trained and equipped personnel. L. Collins (2004, p.170) states “realistic training is a proven path to safer and more effective rescue operations.” NFPA 1006 and 1670 are two excellent documents that provide guidance for training in structural collapse rescue. NFPA 1006, Standard for Rescue Technician Professional Qualifications, 2003 Edition, is the standard that details the specific knowledge and skills necessary for job performance as a rescue technician (NFPA 1006, 2003). Chapter 10 of the standard outlines the knowledge and skills necessary to be qualified as a structural collapse rescue technician (Appendix B). NFPA 1670, Standard on Operations and Training for Technical Search and Rescue Incidents, 2004 Edition, says that on-

going training shall be provided by the department to ensure capabilities are maintained (NFPA 1670, 2004). It goes on to promote the utilization of performance-based evaluation as the primary basis for on-going training. If a team exhibits poor performance then a greater amount of time should be spent improving the needed skills. Chapter 5 of the standard outlines additional training requirements for organizations operating at the technician level for structural collapse (NFPA 1670, 2004, section 5.4.1). The following disciplines are included in section 5.4.1 – technician level for rope rescue, confined space rescue, vehicle and machinery rescue, and trench and excavation rescue. These topics are generally considered the building blocks to a structural collapse rescue training program and many organizations that provide instruction in the FEMA SCT course require these as prerequisites. Both NFPA 1006 and 1670 leave the on-going training requirements up to the authority having jurisdiction to decide on hours and levels of competencies.

(2) What are the Federal Emergency Management Agency Urban Search and Rescue Task Force Teams doing for on-going training needs? The literature search provided very little specific information regarding on-going training requirements for the FEMA teams. According to Dionne (2002) the FEMA teams must diligently train to prepare for building collapses. He goes on to say that Texas Task Force 1 conducts operational readiness exercises to assess their team's response capabilities. This type of training is performance based with a focus on deployment readiness. A search of available FEMA US&R team web sites revealed that Massachusetts Task Force 1 requires monthly training (MA-TF 1, 2007, Training); Missouri Task Force 1 requires monthly, every other month, and quarterly training depending on team position (MO-TF 1, 2007, ¶ 2); and Virginia Task Force 1 requires its members to attend monthly training and an annual 72-hour field exercise (VA-TF 1, 2007, ¶ 7). T. Gallagher

(personal communications, April 23, 2007), Operations Section Chief FEMA/US&R IST and Chairman of the US&R Operations Group, says FEMA has published position description requirements for all 19 team positions and every member must meet those requirements to be considered for deployment. Along with the position descriptions are general training requirements that must be met, however in each case there are no specific continuing education requirements but he says they are now looking at developing on-going training requirements for each position.

(3) What are other state-organized structural collapse rescue teams doing for on-going training needs? C. Campbell (2004) describes the on-going training efforts of three teams: Puerto Rico trains their members to the FEMA US&R standards and provides periodic drills throughout the year which includes a yearly field exercise and evaluation; Nashville, TN, also follows the FEMA standards and provides terrorism awareness, high-angle and confined space rescue training; and Illinois instituted stringent selection and recruitment standards so that the initial training is minimized and the focus is geared towards filling the training weaknesses of its members. The on-going training consists of spot training and two field exercise each year with one specific technical rescue drill. Like the other two teams it also institutes a revalidation exercise every three years. In a one-on-one interview article with K. Miller, (Wilmoth, 2004, p. 72) says Florida adopted the same initial training requirements that the FEMA teams use.

(4) What challenges are teams facing that prohibit their members from participating in on-going training opportunities? Some of the challenges described in the book Urban Search and Rescue in Collapsed Structures (2005, p. 7) was finding fully qualified instructors, appropriate training facilities, and equipment and consumables to conduct the training. The text goes on to recommend that departments send their personnel to recognized schools whenever possible. This

helps to ensure qualified instructors that are instructing at appropriate facilities. Puerto Rico (Campbell, 2004) sends a group every year to Disaster City located at Texas A&M University in College Station, Texas. Dionne (2002) describes this facility as a comprehensive facility, considered one of the finest in the country for US&R teams.

Cost containment is another major challenge for most fire departments and the additional dollars needed for this specialized training is a strain on most. This is emphasized in Appendix A, section A.4.1.7.2, of NFPA 1670 (NFPA 1670, 2004) where it says that on-going training is commonly based on fiscal as well as time constraints. This was highlighted in an article by Naum (2003) describing the wave of hazardous materials teams that were developed in the 1980s that were later forced to re-evaluate their level of commitment because of the demands of time and financial support that were necessary to maintain their programs. According to Jaslow (2004) technical rescue teams are a rarity because of the increased training time necessary to maintain a high level of competence and the need for annual didactic and practical training.

(5) What are the financial costs associated with on-going training for structural collapse rescue response? The literature review did not reveal specific costs associated with on-going training for structural collapse rescue. The survey instrument asked specifically what teams were spending to provide on-going training for each member. However, some general information was found in the literature. Seattle Deputy Chief A.D. Vickery (Elliott, 2002, p. 23) says the biggest hurdle for him is keeping rigs in service and not taking them out of service for training. This is a challenge and a strain for many departments especially when there are no overtime dollars to provide for back-fill of personnel. Vickery asserts that some of the recent federal dollars sent to states to help with preparedness should help pay for these expenses. L. Collins (2004) emphasized this in his book, Technical Rescue Operations, by saying funds are not being

directed to these types of programs and that departments across the country are wondering how they will meet the requirements in the shadow of budget cuts. Endrikat (1997, p. 34) promotes small-scale training that focuses on such topics as shoring operations or concrete cutting and breaching to maintain a cost-effective session.

Procedures

The procedure used in preparing this paper began with a review of industry journals, periodicals, standards, and Internet websites. A literature search at the Learning Resource Center at the National Emergency Training Center was done in July 2006. Additionally, a literature review was conducted at the Minnesota State Colleges and University, Fire/EMS/Safety Center Library in early 2007. The literature review provided limited information specific to the research questions; however, the survey instrument along with additional information provided by some of the survey participants was invaluable. Following the literature review a descriptive research methodology was utilized to help provide answers to the research questions.

An electronic survey instrument was sent to known individuals associated with 33 states that had or were developing a state US&R program. Additionally, 23 surveys were sent to a contact point for the FEMA US&R Teams. There are 28 FEMA US&R Task Force Teams in the system but only 23 contact points were obtained for this survey. I was unable to obtain a contact point for several of the California teams therefore a survey was sent to the Governor's Office of Emergency Services, Response and Recovery Division, Fire and Rescue Branch which oversees all the California FEMA Task Force Teams. The list of contacts was obtained form the State Urban Search & Rescue Alliance (SUSAR Teams) group and the FEMA web sites (US&R Task Force Locations) for the US&R Task Force Teams (Appendix C). An e-mail distribution list was created and an introduction letter explaining the intent of the survey along with a web link to the

survey utilizing SurveyMonkey.com was sent on March 12, 2007 (Appendix D). Fifty-six surveys were distributed (Appendix E). Each respondent was asked to complete the survey and send any additional information via e-mail (SurveyMonkey.com is an online survey software business that assists customers in survey design, response collection, and results analysis).

The survey was divided into four sections—Demographics, Training, Training Standards, and Training Challenges. The first section of the survey began with several questions that were intended to provide information about sponsoring agencies, primary mission and team composition. The Training section of the survey asked questions relating to the types of on-going training that were being covered, the frequency of training, minimum attendance requirements, and the consequences for not attending the training. Section three, Training Standards, addressed the first research question regarding standards utilized by teams during their on-going training sessions. The final section, Training Challenges, attempted to yield information regarding costs and other elements that make on-going training a challenge.

A limitation to this project may be realized by the national-level focus and not seeking input at the local or regional level which may have provided valuable information. However, the national perspective was intended as a tool to assess common practices so that local or regional programs could be reviewed in future projects. A primary reason for this is Edina Fire Department is expected to respond statewide and there could be a high potential for interaction with FEMA or other state US&R Task Force Teams during a state deployment.

Results

A total of 31 (55%) of the 56 surveys distributed were returned. Thirty-one were sent to states that were known to have started or were in the developmental phase of state-initiated US&R teams. Twenty-four surveys were sent directly to FEMA US&R Task Force Teams and

one survey was sent to the California Governor's Office of Emergency Services, Response and Recovery Division, Fire and Rescue Branch to obtain information on behalf of the remaining California FEMA US&R Task Forces. Sixteen (52%) states, 14 (58%) FEMA Task Force Teams and the California Office of Emergency Services responded to the survey.

The Demographic section of the survey revealed the following results. The majority of the teams (39%) were state sponsored teams. Twenty-nine percent of the respondents were federal teams and the remaining ten (32%) were a combination of local, regional, state or federal programs. Twenty-seven (87%) teams stated their primary mission was to respond to structural collapse rescues. Four of the respondents (13%) stated they were equally responsible for all the question choices. The number of team members ranged from less than 30 to over 250 members. The most common team size (26%) was 201 to 250 members; the second most common team size was divided evenly (19%) between the 101 – 150 members and 151 – 200 members. Four (13%) respondents stated their teams ranged from 30 – 50 members and three teams (10%) had team sizes of 51 – 100 members. Two respondents (7%) stated their teams were made up of only their department personnel but the plurality (26%) of the teams were a compilation of over 25 different agencies (one respondent stated they had over 60 agencies involved in their program). Seven (23%) surveys ranged from two to five agencies, seven (23%) ranged from six to ten agencies, four (13%) ranged from 11 to 15 agencies and three (10%) had a range of 16 to 20 agencies. None of the respondents stated a range of 21 – 25 agencies.

Section two of the survey attempted to provide details for the type, frequency, hours, minimum attendance, and the consequences for not attending on-going training. Twenty-five (83%) of the respondents stated they had a core set of training topics for their members. Five (17%) stated they had no core set of topics for their on-going training. One respondent did not

answer the question. The topics most frequently (75% or greater) selected were safety (76%), shoring (80%), breaching & breaking (84%), rope rescue (80%), and confined space rescue (80%). The next most common responses (greater than 50%) were lifting & moving (72%), search (68%), trench collapse rescue (68%), and hazardous materials operations (56%). Eight (32%) respondents stated they had additional on-going core training requirements for position-specific assignments such as medical specialist, K-9 handlers and logistics specialist. Six respondents (19%) did not answer this question. Most teams (61%) train on a monthly basis. The next most common (25%) reply was quarterly. Two teams (7%) train bimonthly, and four teams (14%) train annually. None of the respondents stated they train semiannually and three respondents (10%) did not answer the question. Ten of the 31 respondents (36%) stated that their training sessions on average lasted eight hours. Two surveys (7%) indicated training sessions lasting as little as two hours and one survey (4%) indicated that greater than 20 hours were spent during an on-going training session. This respondent was one of the four teams that stated they only train once a year. Five respondents (18%) dedicated four hours to training, eight (29%) spend six hours, and two (7%) stated an average of ten hours were spent during an on-going training session. Three respondents (10%) did not answer this question. There was an equal split between the minimum annual attendance requirements for on-going training. Seven respondents (25%) stated 50% was the minimum and seven (25%) stated 75% was the minimum requirement. Only four surveys (14%) stated that their members needed to attend 100% of on-going training annually. Ten respondents provided additional comments: four teams stated they had no minimum requirements; two teams stated on-going training attendance was factored into deployment status of its members; one team stated attendance requirements were established by each task force region; two teams required that only its members maintain the necessary

certification requirements for their position, i.e. paramedic, structural specialist; and one team required a skills proficiency demonstration every two years. The survey revealed that all team positions had a varying degree of responsibility for on-going training requirements. Twenty-three (82%) of the 28 teams that responded to question 11 (Who do the minimum requirements apply to?) identified the rescue specialist as the most common group that had to meet the requirements. Two surveys (7%) stated that all team members had to meet the minimum requirements and one survey stated they had no set standards. Team doctors were the least selected group (36%) for needing to meet the minimum standards. The following is a break-down of the remaining positions from the most to the least commonly selected as needing to meet the minimum requirements: squad managers (75%), search specialist (71%), logistics specialist (68%), medical, hazardous materials, and communications specialist (64%), task force leaders (61%), safety specialist (57%), K-9 handlers (54%), and structural specialist (46%). The final question in the Training section of the survey utilized an open-ended question to ascertain the consequences for not meeting the minimum on-going training requirements. Twenty-seven respondents (87%) replied to the question. Thirteen of the respondents (48%) stated the member would be designated as non-deployable and several explained that the member would have 6 to 12 months to complete all the missed make-up training or they would be terminated from the team. Seven teams (26%) stated they dismiss members who do not complete the annual training requirements. Two teams (7%) described a tiered approach with a verbal warning first, followed by a written warning, then either designating the member as non-deployable or terminating them. One team uses a point system which is based on training hours and service hours to determine skills proficiency. One team leaves this responsibility to task force leaders of each task force, and three teams (11%) do not have any consequences in place for missed on-going training.

The Training Standards section of the survey asked specific questions that would provide answers for the first research question. Twenty-nine of the 31 survey respondents answered the questions in this section. Twenty-eight (97%) of the teams follow NFPA 1670, Standard on Operations and Training for Technical Search and Rescue Incidents, 24 teams (83%) follow NFPA 1006, Standard for Rescue Technician Professional Qualifications, 22 teams (76%) follow the FEMA Field Operations Guide (FOG) Manual which is produced by the U.S. Army Corps of Engineers, one team follows a state produced FOG manual, nine teams (31%) follow state operating guidelines or policies, 13 teams (45%) follow local standard operating guidelines, and another 13 teams follow OSHA regulations during their on-going training. Twelve respondents identified the following OSHA regulations as being followed when conducting on-going training:

- 1910.120, Hazardous Waste Operations and Emergency Response
- 1910.132, Personal Protective Equipment
- 1910.134, Respiratory Protection
- 1910.146, Permit-required Confined Spaces
- 1910.147, The Control of Hazardous Energy (lockout/tagout)
- 1910.156, Fire Brigade
- 1910.1030, Bloodborne Pathogens
- 1910.1200, Hazard Communication
- 1926 Subpart P, Excavations

The final section of the survey addressed the challenges teams were facing during on-going training. Sixteen out of 26 surveys (62%) responded by saying there was not enough time to complete the necessary training, 11 (42%) stated that no wage reimbursement was a challenge,

10 (38%) said poor attendance was a factor, and three (12%) stated poor logistical support was a challenge they were facing. Seven teams provided additional comments and they are as follows:

- Lack of a good training site.
- Delivering basic training for new members and advanced training to the more experienced members of the team.
- We are a new team and have only done deployment training together. Each individual department is required to maintain the technician ongoing training for rope, trench, confined space, vehicle/machinery, and structural collapses. Challenges are making sure that there is time to do all this recertification work. The goal is to standardize the number of hours for each team and exercise twice a year. Much of my departments training occur on duty. Each member gets 6 – 8 hours a month in one of the above disciplines.
- Not enough funding from FEMA and the State to bring all personnel together. We have about 60 participating agencies and personnel need to be paid and employers need to be reimbursed.
- Time away from host city.
- With the state controlling the training there have been problems.
- Consistency of content because the training is conducted once a month on each shift and sometimes by different instructors. Sometimes content and certainly emphasis may vary from session to session.

Sixteen (57%) teams stated that the member's host agency was responsible for covering wages for on-going training, four teams (14%) stated that wages were covered by state or federal funds, and six teams (21%) stated wages were not covered for on-going training. Two respondents provided additional comments:

- As each of our Task Forces are staffed by FF's and civilians alike each are different. Civilians are covered under the Disaster Service Workers Legislation and as such cannot be compensated for training. Some fire agencies MOA's have pay provisions for certain activities while others do not.
- Currently all training is done on duty. As we enter into the state agreement the state will cover training costs outside what is done on duty.

For the teams that received some wage reimbursement for on-going training, 18 teams stated it was for overtime, 16 teams stated wages were covered for hire backs, and eight teams stated it was for straight time only. Four teams chose all three choices and the most common type of reimbursement was for overtime and hire back wages. One team does not reimburse any wages for training. Four teams stated the type of reimbursement was determined by the sponsoring or participating agencies and varied widely. The final question of the survey was an open ended question asking the respondents to estimate the annual cost per team member for on-going training. Nine respondents provided information regarding the cost associated with the on-going training of a member for one year. The lowest estimated cost for on-going training for one team member was $600 and the highest was $10,000 with an average cost approximated at $4,500.

Discussion

Fires suppression calls are decreasing while training and response to technical rescues increase. Recent history has shown a definite need for specialized training to respond to structural collapse incidents and the federal government has acknowledged this by pouring billions of dollars into this effort. As stated in an article by LaFemina "untrained members should not act outside of the scope of their training; this could lead to unnecessary injuries or fatalities" (2004, p. 134). The days of learning technical rescue on-the-job are over because of

the many complex skills necessary to ensure safe operations. More importantly, departments must have a plan for on-going training that ensure their initial investment will provide the citizens with a cost effective program that can deliver efficient and effective rescue operations for years to come. It is the responsibility of the incident commander to ensure that properly trained and equipped personnel are on the scene to safely mitigate the incident. Anything less is a recipe for disaster.

The literature review and survey instrument provided valuable information regarding on-going training for structural collapse rescue teams across the nation. Thirty-one of the 56 nationally distributed surveys were returned. This research project has shown that there is wide range of approaches to on-going training but it did show some commonalities.

The survey revealed that MN-TF 1 is very similar in structure to many of the other teams. MN-TF 1 is sponsored by the State albeit through federal grant dollars and its primary mission is to respond to structural collapse rescues. By the end of 2007 MN-TF 1 will have over 200 members coming from five sponsoring agencies and over 35 supporting agencies. These numbers emphasize the importance for Edina Fire Department's SOT to develop an on-going training program that will work in concert with the other agencies.

On-going training should be guided by nationally accepted standards or procedures and the literature review and survey showed excellent resources for this guidance. In fact, in many standards, whether they were industry consensus standards or mandated through law, it was clearly stated that the need to provide on-going training was essential to prevent injuries and death to its members. For example, NFPA 1500, Standard on Fire Department Occupational Safety and Health Program, stated "fire departments shall provide specific and advanced training to members who engage in special operations as a technician" (NFPA 1500, 2007, section,

5.4.1). This fact is clearly understood when 29 of the 31 respondents indicated that they follow a multitude of standards when conducting on-going training. Clem (2001) stressed that NFPA 1670 is an excellent standard to help guide a department in making sure they are covering the basic training necessary to function at whatever level has been determined by the authority having jurisdiction. Over 95% of the survey respondents stated following this standard in their on-going training program. In addition, 83% follow NFPA 1006 (NFPA 1006, 2003) and over 75% of the teams follow the FEMA FOG manual. Even though OSHA does not write specific standards for the fire service there are several that are closely followed when working in the structural collapse rescue environment and should be included in developing on-going training program. Each of the OSHA standards indicated in the literature review and the survey results is already being incorporated in some aspect of the overall Edina Fire Department's training program. However, a special focus is made to address the confined space and excavation standards in the special operations training. The research showed that realistic training was critical and this was stressed in the appendices of NFPA 1670 that the training should be performance-based in nature (NFPA 1670, 2004, section A.4.1.7.2). OSHA standard on Hazardous Waste Operations and Emergency Response (OSHA 1910.120) promotes an annual refresher training that demonstrated competency and again in the Permit-required Confined Spaces standards (OSHA 1910.146) it states that training should be representative of spaces found in the response area. Utilizing performance-based training to guide poor performance is a better way to assess the time that should be spent for improving the skills. The survey respondents indicated the importance of this performance-based training by the fact that many teams institute some type of performance evaluation conducted annually.

According to Urban Search and Rescue in Collapsed Structures (2005, p. 8) continuing practice of the initial skills learned needs to be done on a regular basis. However, the survey revealed that the approach to on-going training was widely varied from the East coast to the West. Nowhere in the literature did it indicate a minimum number of hours for on-going training, but several documents stated at a minimum the training should be conducted annually. In fact, NFPA 1006 and 1670 leave this decision up to the authority have jurisdiction. However, most teams (61%) that responded to the survey stated they train monthly. When the teams get together to train most (36%) will train for eights hours while 29% train for six hours and 18% train for four hours. Edina's SOT monthly, eight-hour session was very similar to many of the survey respondents training descriptions. Over 83% of the survey respondents stated they had a core set of on-going training topics for their teams. The most commonly selected topics were consistent with the FEMA Structural Collapse Technician course (Appendix A) such as breaching and breaking (84%), shoring, rope and confined space rescue (80%), safety (76%), lifting and moving (72%), and search and trench collapse rescue at 68%. Several teams had additional training requirements for position-specific assignments such as K-9 handlers and physicians. The Edina SOT is primarily training to the rescue specialist position with only a few members receiving the medical specialist training. Eight-two percent of the teams agree that minimum standards must apply to the rescue specialist. The possible reason for this may be the fact that this position requires a specialized skill set unlike some of the other positions where they bring many of their skills with them from their profession such as a paramedic, physician, and structural specialist. Half of the respondents set their minimum on-going training attendance at either 50% or 75%. Only four (14%) respondents stated their members needed to attend 100% of all training. It seems reasonable to continue the 75% minimum attendance standard that is

already instituted in the Edina program. There currently is no disciplinary plan for the Edina members who do not make the minimum requirements. The survey indicated that 48% of the team members who do not meet the minimum standards are classified as non-deployable. However, most of these teams have some type of make-up procedure in place which allows for a six to 12 months timeline before termination.

According to T. Gallagher (personal communications, April 23, 2007), the lack of funding is the biggest challenge facing structural collapse rescue teams. The need to balance the costs – quality training facilities, instructors, props, tool maintenance, equipment repair and replacement, consumables, overtime and hire-back – makes on-going training a real challenge. Jaslow (2004) highlights this dilemma by the fact that these types of specialized teams are rare because of these challenges. Sixty-two percent of the teams surveyed said there was not enough time to complete all their training. Forty-two percent stated that wage reimbursement was a big challenge and 38% said poor attendance was yet another challenge. All of these challenges are compounded in an economy that is focused on cost containment. The State of Minnesota does not provide for any wage reimbursement for on-going training and 57% of the respondents stated their host agency was responsible for paying wages for on-going training. For the teams that did receive wage reimbursement most were covered for overtime and hire back. Edina Fire Department already has a policy that states when a member attends department required training they must be compensated for there hours worked. The survey showed that the cost to keep a structural collapse rescue team member proficient in their skills ranges widely. The survey revealed an average cost per team member of $4,500. However, Vickery (Elliot, 2002) states the recent federal dollars can help with these expenses. The most important thing to remember is that yes it is expensive to train, but it is a lot more expensive to not train, especially in this business.

Recommendations

The purpose for the project was to determine the on-going training practices utilized by state and federal US&R teams. The literature review along with the survey instrument provided valuable information regarding common approaches to on-going training. The following recommendations will benefit the members of Edina Fire Department by providing the necessary information to develop an on-going structural collapse rescue training program for the members of the Special Operations Team. Establishing an annual on-going training program will ensure an efficient and effective team that will benefit us in our participation as a member of MN-TF 1. The research results indicated several best practices when developing an on-going training program for structural collapse rescue. Based on the research, several recommendations are listed below.

- The Edina Fire Department must develop an on-going structural collapse rescue training program that incorporates the structural collapse elements of NFPA 1006 and 1670. The program development should include OSHA 1910.146, Permit-required Confined Space and Subpart P, Excavation.
- Many of the existing state US&R teams have patterned their programs after the very successful FEMA US&R program. The Edina Fire Department should take advantage of these efforts by utilizing the FEMA Structural Collapse Technician course curriculum as a guide to establish the necessary skills for an on-going training program. Topics to be included in this program should include the elements of shoring, lifting and moving, breaching and breaking, search, safety, structural engineering and hazardous materials.
- The on-going training program must include elements of rope, confined space and trench collapse rescue. Again, NFPA 1006 and 1670 can provide valuable input for these topics.

- Continue monthly training sessions lasting a minimum of eight hours each. Efforts should be made to find opportunities to extend these sessions when appropriate.
- Minimum attendance requirements of 75% should be enforced for all team members. A progressive disciplinary procedure should be established and enforced for all team members to ensure their and team members' safety.
- As new disciplines or team specific positions are developed through MN-TF 1 additional on-going training requirements will be needed.
- The City of Edina has been a strong supporter of the existing program and efforts need to continue to ensure its success. Efforts need to be made with the State to find options to offset the high cost of this type of training especially for wage reimbursement.
- An extensive assessment needs to be conducted to identify the costs associated with training the core members of the Edina Special Operations Team.
- The on-going training program should be developed in concert with the efforts of the other sponsoring agencies to ensure consistent performance across all agencies involved with MN-TF 1.

Because of the extensive amount of training that is required to safely conduct structural collapse rescues it will be imperative that Edina Fire Department include these recommendation in the development of a plan that identifies the necessary requirements to ensure safe operations.

Reference List

Brakhage, C., Kitchel, W. (Eds) (2005). *Urban search and rescue in collapsed structures*. Stillwater, OK: Fire Protection Publications Olkahoma State University.

Campbell, C. (2004, March). Shoring up US&R. *Homeland Protection Professional, 3,* 34 – 38.

Clem, L. (2001, February). NFPA 1670: Operations and training for technical rescue incidents. *Advanced Rescue Technology, 4,* 57 – 59.

Collins, L. (2004). *Technical rescue operations, volume I: planning, training, & command* Tusla, OK: PennWell Corporation.

Dionne, B. (2002, December). Disaster masters. *Fire Rescue Magazine, 20,* 40 – 47.

Elliott, T. (2002, March). War-on-terrorism: federal sites offer unique, no-cost training for first responders. *Fire Rescue Magazine, 20,* 21 – 23.

Endrikat, F. (1997, July). Building collapse operations training. *Firehouse, 22,* 30 – 34.

Federal Emergency Management Agency. US&R Task Force Locations. Retrieved April 15, 2007, from http:www.fema.gov/pdf/emergency/usr/locations.shtm

Jaslow, D. (2004, April). Reshaping the mission parameters of technical rescue teams. *Advanced Rescue Technology, 7,* 27 – 33.

Lafemina, F. (2004, October). Real-time rescue. *Fire Engineering 157,* 127 – 134.

Massachusetts Task Force 1. (2007). Training. Retrieved April 26, 2007, from http://www.matf.org

Missouri Task Force 1. (2007). Training. Retrieved April 26, 2007, from http://www.bcfdmo.com/missouri...tf1/training

National Fire Protection Association. (2007). *Fire department occupational safety and health program*. (NFPA 1500). Quincy, MA: Author

National Fire Protection Association. (2004). *Standard on operations and training for technical rescue incidents*. (NFPA 1670). Quincy, MA: Author

National Fire Protection Association. (2004). *Organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by career fire departments*. (NFPA 1710). Quincy, MA: Author

National Fire Protection Association. (2004). *Organization and deployment of fire suppression operations, emergency medical operations, and special operations to the public by volunteer fire departments*. (NFPA 1720). Quincy, MA: Author

National Fire Protection Association. (2003). *Standard for rescue technician professional qualifications*. (NFPA 1006). Quincy, MA: Author

Naum, C. J., (2003, June). Developing training compliance for special operations technical rescue. *The Voice*, 32, 9 – 19.

Occupational Safety and Health Administration. (1993). *Standard on permit-required confined space*. (29 CFR 1910.146). Washington, DC: U.S. Government Printing Office

Occupational Safety and Health Administration. (1994). *Standard on hazardous waste operations and emergency response*. (29 CFR 1910.120). Washington, DC: U.S. Government Printing Office

Occupational Safety and Health Administration. (1989). *Standard on excavations*. (29 CFR 1926.650). Washington, DC: U.S. Government Printing Office

State Urban Search and Rescue Alliance. State Teams. Retrieved April 15, 2007, from http://www.susar.org/teams/index.cfm

United States Fire Administration. (2005). *Executive leadership*. Emmitsburg, MD: USFA, National Fire Academy.

Virginia Task Force 1. (2007). About VA-TF 1. Retrieved April 26, 2007, from http://www.vatf1.org/about.cfm

Wilmoth, J. (2004, April). Tacking up the slack. *Fire Chief, 57*, 70 – 76.

Appendix A

FEMA National Urban Search & Rescue Response System
80-Hour Structural Collapse Technician Course Outline

Day 1

Module I – Program Orientation and Overview
1a Administration and Introductions
1b Safety
1c Structural Engineering Systems I – IV
1d Tool Labs

Day 2

Module II – Shoring
2a Shoring Basics (Lecture)
2b Shoring Practical (Rotation Modules)

Day 3

Module II – Shoring
2b Shoring Practical (Rotation Modules)

Day 4

Module III – Breaching and Breaking
3a Breaching, Breaking, Cutting, and Burning Basics (Lecture)
3b Breaching, Breaking, Cutting, and Burning Practical (Rotation Modules)

Day 5

Module III – Breaching and Breaking
3b Breaching, Breaking, Cutting, and Burning Practical (Rotation Modules)

Day 6

Module IV – Lifting and Rigging
4a Lifting and Rigging Basics (Lecture)
4b Lifting and Rigging, Airbags, Anchoring, Crane Operations Practical (Rotation Modules)

Day 7 Module IV – Lifting and Rigging
4b Lifting and Rigging, Airbags, Anchoring, Crane Operations Practical (Rotation Modules)

Day 8 Competency Testing
8a Post Test (Written)
8b Structural Collapse Practical Skills Scenarios
8c De-brief, Critique, Review, and Clean-up

Appendix B

NFPA 1006 Standard for Rescue Technician Professional Qualifications
2003 Edition
Chapter 10 Structural Collapse Rescue

Chapter 10 Structural Collapse Rescue

10.1 General Requirements.

The job performance requirements defined in 10.1.1 through 10.1.16 shall be met prior to certification in structural collapse rescue.

10.1.1* Conduct a size-up of a collapsed structure, given an incident and specific incident information, so that existing and potential conditions within the structure and the immediate periphery are evaluated, needed resources are defined, hazards are identified, construction and occupancy types are determined, collapse type is identified if possible, the need for rescue is assessed, a scene security perimeter is established, and the size-up is conducted within the scope of the incident management system.

(A) *Requisite Knowledge:* Identification of construction types, characteristics, and probable occupant locations; methods to assess rescue needs; expected behavior of each construction type in a structural collapse incident; causes and associated effects of structural collapses; types and capabilities of resources; general hazards associated with structural collapse and size-up; and procedures for implementing site control and scene management.

(B) *Requisite Skills:* The ability to categorize construction types, evaluate structural stability and hazards, and implement resource and security (scene management) protocols.

10.1.2 Determine potential victim locations, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.

(A) *Requisite Knowledge:* Capabilities and limitation of search instruments and resources, types of building construction, occupancy classifications, collapse patterns, victim behavior, and potential areas of survivability. Chapter 10 Structural Collapse Rescue

10.1 General Requirements.

The job performance requirements defined in 10.1.1 through 10.1.16 shall be met prior to certification in structural collapse rescue.

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(A) *Requisite Knowledge:* Identification of construction types, characteristics, and probable occupant locations; methods to assess rescue needs; expected behavior of each construction type in a structural collapse incident; causes and associated effects of structural collapses; types and capabilities of resources; general hazards associated with structural collapse and size-up; and procedures for implementing site control and scene management.

(B) *Requisite Skills:* The ability to categorize construction types, evaluate structural stability and hazards, and implement resource and security (scene management) protocols.

10.1.2 Determine potential victim locations, given size-up information, a structural collapse tool kit, the type of construction and occupancy, time of day, and collapse pattern, so that search areas are established and victims can be located.

(A) *Requisite Knowledge:* Capabilities and limitation of search instruments and resources, types of building construction, occupancy classifications, collapse patterns, victim behavior, and potential areas of survivability.

(B) *Requisite Skills:* The ability to use size-up information, occupancy classification information, and search devices, and assess and categorize type of collapse.

10.1.3 Develop a collapse rescue incident action plan, given size-up information and a collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.

(A) *Requisite Knowledge:* Incident-specific size-up information, incident management system components, dynamics of incident conditions and peripheral areas, incident-specific resources in a given geographical area, construction and occupancy types, scene security requirements, personnel needs and limitations, and rescue scene operational priorities.

(B) *Requisite Skills:* The ability to utilize size-up information, implement an incident management system, monitor changing conditions specific to the incident, identify potential specialized resources, determine construction and occupancy types, identify specific incident security requirements, and create written documentation.

10.1.4 Implement a collapse rescue incident action plan, given an action plan and a collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.

(A) *Requisite Knowledge:* Components of an action plan specific to collapse incidents, incident management systems, dynamics of incident conditions and peripheral areas, identification of specialized resource lists, hazard identification, rescue and extrication techniques consistent with each collapse and construction type, perimeter security measures, and personnel needs and limitations.

(B) *Requisite Skills:* The ability to implement the components of an action plan in a collapse incident, implement an incident management system, initiate hazard mitigation objectives, request specialized resources, initiate rescue objectives, and demonstrate perimeter security measures.

10.1.5 Search a collapsed structure, given personal protective equipment, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.

(A) *Requisite Knowledge:* Concepts and operation of the incident management system as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, potential victim locations as related to

the type of structure and occupancy, building construction, collapse types and their influence on the search function, operational protocols, and various hazards and their recognition.
(B) *Requisite Skills:* The ability to implement an incident management system, apply search techniques, use marking systems, identify and mitigate hazards, and select and use victim locating devices.
10.1.6* Stabilize a collapsed light-frame structure as a member of a team, given size-up information, a specific pattern of collapse, a basic structural collapse tool kit, and an assignment, so that strategies to effectively minimize the movement of structural components are identified and implemented; hazard warning systems are established and understood by participating personnel; incident-specific personal protective equipment is identified, provided, and utilized; physical hazards are identified; confinement, containment, and avoidance measures are discussed; and a rapid intervention team is established and staged.
(A) *Requisite Knowledge:* Identification and proper care of personal protective equipment; structural load calculations for shoring system requirements; shoring systems for stabilization; specific hazards associated with light-frame structural collapse; strategic planning for collapse incidents; communications and safety protocols; atmospheric monitoring equipment needs; identification, characteristics, expected behavior, type, causes, and associated effects of light-frame structural collapses; and recognition of, potential for, and signs of impending secondary collapse.
(B) *Requisite Skills:* The ability to select and construct shoring systems for collapses in light-frame structures, use personal protective equipment, perform structural load calculations, determine resource needs, select and operate basic and specialized tools and equipment, implement communications and safety protocols, and mitigate specific hazards associated with shoring tasks.
10.1.7* Stabilize a collapsed heavy construction-type structure as a member of a team, given size-up information, hazard-specific personal protective equipment, an assignment, a specific pattern of collapse, a basic structural collapse tool kit, specialized equipment necessary to complete the task, and engineering resources if needed, so that hazard warning systems are established and understanding by team members is verified, all unstable structural components that can impact the work and egress routes are identified, alternative egress routes are established when possible, expert resource needs are determined and communicated to command, load estimates are calculated for support system requirements, all shoring systems meet or exceed load-bearing demands, shoring systems are monitored continuously for integrity, safety protocols are followed, Rapid Intervention Crew (RIC) are established and staged to aid search and rescue personnel in the event of entrapment, an accountability system is established, atmospheric monitoring is ongoing, and progress is communicated as required.
(A) *Requisite Knowledge:* Identification and proper care of personal protective equipment, structural load calculations for shoring system requirements, shoring systems for stabilization, specific hazards associated with heavy structural collapse, hazard warning systems, specialized resource and equipment needs, communications and rescuer safety protocols, atmospheric monitoring equipment needs, identification of construction types, characteristics and expected behavior of each type in a structural collapse incident, causes and associated effects of structural collapses, and recognition of potential for and signs of impending secondary collapse.
(B) *Requisite Skills:* The ability to select and construct shoring systems for heavy construction-type collapses, use personal protective equipment, perform structural load calculations,

determine resource needs, select and operate basic and specialized tools and equipment, implement communications and rescuer safety protocol, and mitigate specific hazards associated with shoring tasks.

10.1.8 Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

(A) *Requisite Knowledge:* Resource management protocols, principles for establishing lighting, environmental control methods, and rescuer rehabilitation protocols.

(B) *Requisite Skills:* The ability to manage resources, set up lights, initiate environmental controls, and set up rehabilitation for rescuers.

10.1.9 Release a victim from entrapment by components of a collapsed structure, given personal protective equipment and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

(A) *Requisite Knowledge:* Identification, utilization, and proper care of personal protective equipment; general hazards associated with each type of structural collapse; methods of evaluating structural integrity; crush syndrome protocols; identification of construction types and collapse characteristics; causes and associated effects of structural collapses; potential signs of impending secondary collapse; selection and application of rescue tools and resources; and risk–benefit assessment techniques for extrication methods and time constraints.

(B) *Requisite Skills:* The ability to select, use, and care for personal protective equipment, operate rescue tools and stabilization systems, recognize crush syndrome indicators, and complete risk–benefit assessments for selected methods of rescue and time constraints.

10.1.10* Remove a victim from a collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

(A) *Requisite Knowledge:* Identification, utilization, and proper care of personal protective equipment resources for structural collapse incidents; general hazards associated with structural collapse; identification of construction types; characteristics and expected behavior of each type in a structural collapse incident; causes and associated effects of structural collapses; recognition of potential for and signs of impending secondary collapse; characteristic mechanisms of injury and basic life support; and patient packaging principles.

(B) *Requisite Skills:* Selection, use, and care of personal protective equipment, basic pre-hospital care of soft-tissue injuries, fracture stabilization, airway maintenance techniques, and cardiopulmonary resuscitation; selection and use of patient packaging equipment.

10.1.11* Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted, control and stabilization are maintained before, during, and after the lift, and access can be gained.

(A) *Requisite Knowledge:* Applications of levers; classes of levers; principles of leverage, gravity, and load balance; resistance force; mechanics of load stabilization; mechanics of load lifting; application of pneumatic, hydraulic, mechanical, and manual lifting tools; how to calculate the weight of the load; safety protocols; and stabilization systems.
(B) *Requisite Skills:* The ability to evaluate and estimate the weight of the load, the operations of lifting tools, the application of a lever, and the application of load stabilization systems.
10.1.12* Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.
(A) *Requisite Knowledge:* Applications of rigging systems, applications of levers, classes of levers, inclined planes, gravity and load balance, friction, mechanics of load stabilization and load lifting, capabilities and limitations of lifting tools, how to calculate the weight of the load, and safety protocols.
(B) *Requisite Skills:* The ability to evaluate and estimate the weight of the load, operate required tools, construct and use levers, incline planes, utilize rigging systems, and stabilize the load.
10.1.13 Breach structural components, given an assignment, personal protective equipment, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.
(A) *Requisite Knowledge:* Effective breaching techniques; types of building construction and characteristics of materials used in each; the selection, capabilities, and limitations of tools; safety protocols for breaching operations; calculation of weight; and anticipation of material movement during breaching and stabilization techniques.
(B) *Requisite Skills:* Select and use breaching tools, implement breaching techniques based on building construction type, use personal protective equipment, and apply stabilization where required.
10.1.14 Cut through structural steel, given a structural collapse tool kit, personal protective equipment, and an assignment, so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.
(A) *Requisite Knowledge:* Safety considerations; the selection, capabilities, and limitations of steel cutting tools; cutting tool applications; types of potential and actual hazards and mitigation techniques; and characteristics of steel used in building construction.
(B) *Requisite Skills:* The ability to assess tool needs, use cutting tools, implement necessary extinguishment techniques, mitigate hazards, and stabilize heavy loads.
10.1.15* Construct cribbing systems, given an assignment, personal protective equipment, a structural collapse tool kit, various lengths and dimensions of construction-grade lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.
(A) *Requisite Knowledge:* Different types of cribbing systems and their construction methods, limitations of construction lumber, load calculations, principles of and applications for cribbing, and safety protocols.
(B) *Requisite Skills:* The ability to select and construct cribbing systems, evaluate the structural integrity of the system, determine stability, and calculate loads.
10.1.16 Coordinate the use of heavy equipment, given personal protective equipment, means of communication, equipment and operator, and an assignment, so that common communications

are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.
(A) *Requisite Knowledge:* Types of heavy equipment, capabilities, application and hazards of heavy equipment and rigging, safety protocols, and types and methods of communication.
(B) *Requisite Skills:* The ability to use hand signals and radio equipment, recognize hazards, assess for operator and rescuer safety, and use personal protective equipment.

(B) *Requisite Skills:* The ability to use size-up information, occupancy classification information, and search devices, and assess and categorize type of collapse.
10.1.3 Develop a collapse rescue incident action plan, given size-up information and a collapsed structure, so that initial size-up information is utilized, an incident management system is incorporated, existing and potential conditions within the structure and the immediate periphery are included, specialized resource needs are identified, work perimeters are determined, collapse type/category and associated hazards are identified, construction and occupancy types are determined, incident objectives are established, and scene security measures are addressed.
(A) *Requisite Knowledge:* Incident-specific size-up information, incident management system components, dynamics of incident conditions and peripheral areas, incident-specific resources in a given geographical area, construction and occupancy types, scene security requirements, personnel needs and limitations, and rescue scene operational priorities.
(B) *Requisite Skills:* The ability to utilize size-up information, implement an incident management system, monitor changing conditions specific to the incident, identify potential specialized resources, determine construction and occupancy types, identify specific incident security requirements, and create written documentation.
10.1.4 Implement a collapse rescue incident action plan, given an action plan and a collapsed structure, so that pertinent information is used, an incident management system is established and implemented, monitoring of dynamic conditions internally and externally is established, specialized resources are requested, hazards are mitigated, victim rescue and extraction techniques are consistent with collapse and construction type, and perimeter security measures are established.
(A) *Requisite Knowledge:* Components of an action plan specific to collapse incidents, incident management systems, dynamics of incident conditions and peripheral areas, identification of specialized resource lists, hazard identification, rescue and extrication techniques consistent with each collapse and construction type, perimeter security measures, and personnel needs and limitations.
(B) *Requisite Skills:* The ability to implement the components of an action plan in a collapse incident, implement an incident management system, initiate hazard mitigation objectives, request specialized resources, initiate rescue objectives, and demonstrate perimeter security measures.
10.1.5 Search a collapsed structure, given personal protective equipment, the structural collapse tool kit, an assignment, operational protocols, and size-up information, so that all victim locations and potential hazards are identified, marked, and reported; protocols are followed; the mode of operation can be determined; and rescuer safety is maintained.
(A) *Requisite Knowledge:* Concepts and operation of the incident management system as applied to the search function, application of specialty tools and locating devices, application of recognized marking systems, voice sounding techniques, potential victim locations as related to

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(B) *Requisite Skills:* The ability to select and construct shoring systems for heavy construction-type collapses, use personal protective equipment, perform structural load calculations,

determine resource needs, select and operate basic and specialized tools and equipment, implement communications and rescuer safety protocol, and mitigate specific hazards associated with shoring tasks.

10.1.8 Implement collapse support operations at a rescue incident, given an assignment and available resources, so that scene lighting is adequate for the tasks to be undertaken, environmental concerns are managed, personnel rehabilitation is facilitated, and the support operations facilitate rescue operational objectives.

(A) *Requisite Knowledge:* Resource management protocols, principles for establishing lighting, environmental control methods, and rescuer rehabilitation protocols.

(B) *Requisite Skills:* The ability to manage resources, set up lights, initiate environmental controls, and set up rehabilitation for rescuers.

10.1.9 Release a victim from entrapment by components of a collapsed structure, given personal protective equipment and resources for breaching, breaking, lifting, prying, shoring, and/or otherwise moving or penetrating the offending structural component, so that hazards to rescue personnel and victims are minimized, considerations are given to crush syndrome, techniques enhance patient survivability, tasks are accomplished within projected time frames, and techniques do not compromise the integrity of the existing structure or structural support systems.

(A) *Requisite Knowledge:* Identification, utilization, and proper care of personal protective equipment; general hazards associated with each type of structural collapse; methods of evaluating structural integrity; crush syndrome protocols; identification of construction types and collapse characteristics; causes and associated effects of structural collapses; potential signs of impending secondary collapse; selection and application of rescue tools and resources; and risk–benefit assessment techniques for extrication methods and time constraints.

(B) *Requisite Skills:* The ability to select, use, and care for personal protective equipment, operate rescue tools and stabilization systems, recognize crush syndrome indicators, and complete risk–benefit assessments for selected methods of rescue and time constraints.

10.1.10* Remove a victim from a collapse incident, given a disentangled victim, a basic first aid kit, and victim packaging resources, so that basic life functions are supported as required, victim is evaluated for signs of crush syndrome, advanced life support is called if needed, methods and packaging devices selected are compatible with intended routes of transfer, universal precautions are employed to protect personnel from bloodborne pathogens, and extraction times meet time constraints for medical management.

(A) *Requisite Knowledge:* Identification, utilization, and proper care of personal protective equipment resources for structural collapse incidents; general hazards associated with structural collapse; identification of construction types; characteristics and expected behavior of each type in a structural collapse incident; causes and associated effects of structural collapses; recognition of potential for and signs of impending secondary collapse; characteristic mechanisms of injury and basic life support; and patient packaging principles.

(B) *Requisite Skills:* Selection, use, and care of personal protective equipment, basic pre-hospital care of soft-tissue injuries, fracture stabilization, airway maintenance techniques, and cardiopulmonary resuscitation; selection and use of patient packaging equipment.

10.1.11* Lift a heavy load as a team member, given a structural collapse tool kit and a load to be lifted, so that the load is lifted, control and stabilization are maintained before, during, and after the lift, and access can be gained.

(A) *Requisite Knowledge:* Applications of levers; classes of levers; principles of leverage, gravity, and load balance; resistance force; mechanics of load stabilization; mechanics of load lifting; application of pneumatic, hydraulic, mechanical, and manual lifting tools; how to calculate the weight of the load; safety protocols; and stabilization systems.
(B) *Requisite Skills:* The ability to evaluate and estimate the weight of the load, the operations of lifting tools, the application of a lever, and the application of load stabilization systems.
10.1.12* Move a heavy load as a team member, given a structural collapse tool kit, so that the load is moved the required distance to gain access and so that control is constantly maintained.
(A) *Requisite Knowledge:* Applications of rigging systems, applications of levers, classes of levers, inclined planes, gravity and load balance, friction, mechanics of load stabilization and load lifting, capabilities and limitations of lifting tools, how to calculate the weight of the load, and safety protocols.
(B) *Requisite Skills:* The ability to evaluate and estimate the weight of the load, operate required tools, construct and use levers, incline planes, utilize rigging systems, and stabilize the load.
10.1.13 Breach structural components, given an assignment, personal protective equipment, various types of construction materials, and a structural collapse tool kit, so that the opening supports the rescue objectives, the necessary tools are selected, structural stability is maintained, and the methods utilized are safe and efficient.
(A) *Requisite Knowledge:* Effective breaching techniques; types of building construction and characteristics of materials used in each; the selection, capabilities, and limitations of tools; safety protocols for breaching operations; calculation of weight; and anticipation of material movement during breaching and stabilization techniques.
(B) *Requisite Skills:* Select and use breaching tools, implement breaching techniques based on building construction type, use personal protective equipment, and apply stabilization where required.
10.1.14 Cut through structural steel, given a structural collapse tool kit, personal protective equipment, and an assignment, so that the steel is efficiently cut, the victim and rescuer are protected, fire control measures are in place, and the objective is accomplished.
(A) *Requisite Knowledge:* Safety considerations; the selection, capabilities, and limitations of steel cutting tools; cutting tool applications; types of potential and actual hazards and mitigation techniques; and characteristics of steel used in building construction.
(B) *Requisite Skills:* The ability to assess tool needs, use cutting tools, implement necessary extinguishment techniques, mitigate hazards, and stabilize heavy loads.
10.1.15* Construct cribbing systems, given an assignment, personal protective equipment, a structural collapse tool kit, various lengths and dimensions of construction-grade lumber, wedges, and shims, so that the cribbing system will safely support the load, the system is stable, and the assignment is completed.
(A) *Requisite Knowledge:* Different types of cribbing systems and their construction methods, limitations of construction lumber, load calculations, principles of and applications for cribbing, and safety protocols.
(B) *Requisite Skills:* The ability to select and construct cribbing systems, evaluate the structural integrity of the system, determine stability, and calculate loads.
10.1.16 Coordinate the use of heavy equipment, given personal protective equipment, means of communication, equipment and operator, and an assignment, so that common communications

are established, equipment usage supports the operational objective, hazards are avoided, and rescuer and operator safety protocols are followed.

(A) *Requisite Knowledge:* Types of heavy equipment, capabilities, application and hazards of heavy equipment and rigging, safety protocols, and types and methods of communication.

(B) *Requisite Skills:* The ability to use hand signals and radio equipment, recognize hazards, assess for operator and rescuer safety, and use personal protective equipment.

Appendix C

Survey Recipients/Returned Surveys

1. Alabama, AL-TF 1 (State)
2. Alaska, Anchorage FD (State) **
3. Arizona, AZ-TF 1 (FEMA)
4. Arkansas, Little Rock FD (State) **
5. California, Office of Emergency Service **
6. California, CA-TF 3 (FEMA) **
7. California, CA-TF 5 (FEMA) **
8. California, CA-TF 7 (FEMA) **
9. Colorado, CO-TF 1 (FEMA) **
10. Connecticut, CT-TF 1 (State)
11. Delaware, DE-TF 1 (State)
12. Florida, FL-TF 1 (FEMA) **
13. Florida, FL-TF-2 (FEMA) **
14. Florida, FL USAR (State) **
15. Georgia, GSAR, (State) **
16. Hawaii, Honolulu FD
17. Idaho, State of Idaho
18. Illinois, IL-TF 1 (State) **
19. Indiana, IN-TF 1 (FEMA) **
20. Iowa, IA-TF 1 (State) **
21. Kansas, KS-TF 1 (State) **
22. Kentucky, State of Kentucky
23. Louisiana, LA-TF 1 (FEMA) **
24. Louisiana, SELA-TF 1 (State)
25. Maryland, MD-TF 1 (FEMA) **
26. Maryland, MD-TF 2 (State) **
27. Massachusetts, MA-TF 1 (FEMA) **
28. Michigan, MI-TF 1 (State)
29. Minnesota, MN-TF 1 (State) **
30. Mississippi, State of Mississippi
31. Missouri, MO-TF 1 (FEMA)
32. Nebraska, NE-TF 1 (FEMA) **
33. Nevada, NV-TF 1 (FEMA)
34. New Jersey, NJ-TF 1 (State) **
35. New Mexico, NM-TF 1 (FEMA)
36. New York, NY-TF 1, (FEMA) **
37. New York, NY-TF 2 (State) **
38. North Carolina, NC-TF 1 (State)
39. Ohio, OH-TF 1 (FEMA) **
40. Ohio, ORS-R-2 (State)
41. Oklahoma, OK-TF 1 (State)
42. Oregon, OR-TF 1 (State) **

43. Pennsylvania, PA-TF 1 (FEMA) **
44. Rhode Island, RI-TF 1 (State) **
45. South Carolina, SC-TF 1 (State) **
46. Tennessee, TN-TF 1 (FEMA)
47. Tennessee, TN-TF 2 (State)
48. Tennessee, TN-TF 3 (State) **
49. Texas, TX-TF 1 (FEMA)
50. Texas, TX-TF 2 (State) **
51. Utah, UT-TF 1 (FEMA)
52. Virginia, VA-TF 1 (FEMA)
53. Virginia, VA-TF 2 (FEMA)
54. Washington, WA-TF 1 (FEMA)
55. West Virginia, State of West Virginia
56. Wisconsin, State of Wisconsin

** indicates returned surveys

Appendix D

Survey Cover Letter

Dear [FirstName],

I am asking for your assistance in completing a survey to gain information for an Executive Fire Officer Research project at the National Fire Academy. I am gathering information relating to on-going training requirements for structural collapse rescue. The information you provide will help me describe the variety of procedures being used by other teams in their on-going training and will help the Edina Fire Department develop best practices for their structural collapse rescue program. The survey should take only a few minutes to complete.

Please provide any additional comments as necessary or you can contact me at [redacted].

Here is a link to the survey:
[SurveyLink]

Thanks for your participation,

Tom M. Schmitz
Battalion Chief
Edina Fire Department
Task Force Leader
Minnesota Task Force 1

Please note: If you do not wish to receive further emails from us, please click the link below, and you will be automatically removed from our mailing list.
[RemoveLink]

Appendix E

On-Going Training for Structural Collapse Rescue
Survey Sample

Demographics

1. What is the name of your team?

2. Is the team a state or FEMA US&R sponsored team?

   Yes No

3. What is the PRIMARY mission of your team?

   Structural Collapse Rescue
   Rope Rescue
   Confined Space Rescue
   Trench Collapse Rescue
   Water Rescue
   Wilderness Rescue
   Hazardous Materials Response
   Other

4. How many members are on the team?

   < 30 30-50 51-100 101-150 151-200 201-250 >250

5. How many agencies are represented on the team?

   1 2-5 6-10 11-15 16-20 21-25 >25

Training

6. Does your team have a core set of training topics that all team members must attend on an on-going basis?

   Yes No

7. If yes, please indicate what makes up the CORE training topics. (Choose all that apply)

   Structural Engineering
   Safety
   Shoring
   Lifting & Moving

Breaching & Breaking
Search
Rope Rescue Operations
Confined Space Rescue Operations
Trench Collapse Rescue Operations
Hazardous Materials Operations
Other (please specify)

8. How often does the team have training?

Monthly Bimonthly Quarterly Semiannually Annually

9. On average, how many hours are the training sessions?

2 4 6 8 10 12 14 16 18 20

10. What percentage of the training must a member attend annually?

25% 50% 75% 100% Other (please specify)

11. Who do the minimum attendance requirements apply to (choose all that apply)

Rescue Specialist Search Specialist Medical Specialist HazMat Specialist

K-9 Specialist Team Doctors Structural Specialist Task Force Leaders

Squad Managers Logistics Specialist Safety Specialist Comm.'s Specialist

Other (please specify)

12. What are the consequences if a team member does not meet the minimum training requirements?

<u>Training Standards</u>

13. Which standards does your team follow when conducting on-going training?

NFPA 1006 NFPA 1670 FEMA FOG Manual State SOG's Local SOG's

OSHA Regulations Other (please specify)

14. If you selected OSHA, specify which regulations you follow?

Training Challenges

15. What challenges does your team face in its on-going training?

    Not Enough Time

    Poor Attendance

    Poor Logistical Support

    No Wage Reimbursement

    Other (please specify)

16. Who bears the responsibility for the cost of wages?

17. What categories apply to wage reimbursements? (choose all that apply)

    Straight Time Only

    Overtime

    Hire Backs

    Other (please specify)

18. Please estimate the average costs (wages, materials, instructor fees) associated with on-going training for a team member.